SUPPLEMENT NO. 2

THE JOURNAL OF THE
AMERICAN LEATHER CHEMISTS
ASSOCIATION

ROUND TABLE DISCUSSION

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Sponsored by

THE NEW ENGLAND TANNER'S GROUP

Swampscott, Massachussetts

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FOREWORD

The American Leather Chemists Association, during its fifty years of existence, has been concerned with the manifold aspects of the chemistry of leather making. The chemistry of leather making has proved to be an extremely complex subject, embracing practically all the well-known branches of chemistry which today is, itself, a vast science.

Now, leather making is a pre-eminent example of a skilled craft. It was possible to make beautiful leather without any chemical knowledge, and certainly without realizing the underlying chemistry of the many processes that go into leather making. Consequently, skilled tanners have, at times, expressed the wish that the chemist "would talk our language".

Dr. R. M. Koppenhoefer, President of the American Leather Chemists Association, initiated a new venture on the occasion of the 48th Annual Meeting by inviting the New England Tanners Club to participate in our program. This Club, representing many of the owners, managers, superintendents and foremen in the New England area, undertook to present a symposium covering a discussion of some of the practical aspects of leather making. Under the able chairmanship of Mr. E. D. Lord, the Round Table Meeting was organized. That the subject was stimulating was obvious to all present, and we only hope that this will be a forerunner of many more pleasant meetings at our future annual conventions.

The officers of the Association decided that this symposium should find a permanent record and so, as a tribute to the many men who gave of their time and experience, this symposium has been published and made available by the American Leather Chemists Association.

H. G. Turley, Ph.D.
President
American Leather Chemists Association.
November 17, 1952

Round Table Discussion

Sponsored By

The New England Tanner's Club

WEDNESDAY MORNING

JUNE 4, 1952

SWAMPSCOTT, MASS.

PRESIDING: MR. ERSKINE D. LORD

——oOo——

CHAIRMAN LORD: We have chosen to call this part of our program a discussion of practical tannery problems. This discussion is sponsored by the New England Tanners' Club, an organization similar in its purposes and characteristics to other Tanners' Production Clubs.

The order of our discussion this morning will follow the processes involved in the manufacture of leathers, starting with the soaking operation.

There are many factors to be considered in soaking which we can discuss this morning. For instance, temperatures, times, ratio of water to stock, pH, whether or not we add chemicals, such as poly or tetra-sulphide, or antiseptics. The best way to start the discussion would be to have a specific example. I will ask Mr. Sart to discuss the soaking of kidskins.

SART: We obtain a fairly good result soaking at a temperature of 75 degrees Fahrenheit, using either poly or tetra-sulphide and some of the materials to repress bacterial action. On a hard natured skin we soak two days; on a soft natured skin, one day. I suppose all kid tanners are fortunate in this respect . . . that if the skins are not too well soaked they can break them out, which I am sure the calf men and sideleather men could not do.

LORD: In a general way that brings up a number of problems. You say you soak at a temperature of 75°F. If we look in the literature and see what the chemists tell us, they tell us bacterial action becomes fairly rapid when the temperature is 68°F. Yet in making practical leathers, we are soaking at 75°F. Do you want to elaborate?

SART: The real reason for this is to soak at a temperature where we can maintain uniformity throughout the year. We do not want to add ice in the summertime. The average temperature of our water in the summertime is

about 75 degrees. So we arrived at this 75 degree temperature to have more or less of a uniform balance in the hot and cold weather. Perhaps 68 degrees would be better, but this would require ice in the summertime which would not be too practical for us.

LORD: Do you feel it is advantageous to add into that soaking certain chemicals which might control bacterial action?

SART: I said we do use one of the many.

LORD: You do feel there is a place for those materials?

SART: Positively.

LORD: I think on the point of the temperature I would like to call on John Ivany to see if that agrees with what he does on calf skins.

IVANY: Dr. O'Flaherty told me some years ago that our beamhouse processes, which start with soaking and finish with bating, can be compared to a ladder with several rungs and it is your choice to a certain extent as to how many rungs you want to ascend in any given operation.

I think all of us who are actively engaged in making leather will agree to that. What I say about calfskin soaking may be true in the A. C. Lawrence Calfskin Division but may not be true in another plant only ten miles away, because the number of rungs they want to ascend in each of the soaking, liming or bating operations may be different.

We find that in our experience we have to strike a happy medium. We have to be extremely careful to avoid any loss of hide substance through bacterial action. On the other hand, we have to be certain that we remove all those substances which, for lack of a better name, perhaps, we call soluble proteins.

Mr. Lord mentioned several factors which enter into this, three important ones being the ratio of water to stock, time and temperature.

As far as ratio of stock is concerned, that I believe is fairly well established in practice, being a ratio from either 1 to 4 or 1 to 5. In our case we use 1 to 5.

As far as temperature is concerned, Mr. Sart put his finger on one of the very important considerations there, and that is the minimum temperature of the water that you can obtain in the summertime without icing.

We are very fortunate in this respect since we are using water from our own wells, and even in the summertime it does not rise much over 58 degrees. Therefore, we are able to say that we want to conduct our soaking between 58 and 60 degrees Fahrenheit during the entire year.

As far as time is concerned, we have found that with the proper washing of the stock we can accomplish the soaking in approximately eight hours. It may sound very short to some of you gentlemen, but just remember the rungs on the ladder.

We do not use any chemicals because we are working with good packer skins which arrive in good condition, and since we stopped making suede leather some time ago, we do not use any dry skins.

LORD: I would like to have comments from some of the tanners from other parts of the country. We know that in soaking of skins some tanners soak them a few hours and some soak them for a longer time, a period of one or two days. There must be a reason for it. We believe that this reason, as pointed out by Mr. Sart a few minutes ago, and also by Mr. Ivany, is that whatever you do in the soaks has to be correlated with what you do in your limes and in the bate. We know of side leathers that are soaked for a very short period of time. I wonder if Charles Baker of International could talk a little bit about soaking of side leather.

BAKER: Our experience is a little different from that of Mr. Ivany. Our soak is only for a three hour duration, we really go to the other extreme. Then the hair is burned off in a twenty-four hour process. We would prefer to soak for a longer period of time but space and equipment governs our short soak. We have not found any particular difficulty with the leathers produced with this short soaking.

LORD: I think that brings out the point, that leather can be made with a minimum period of soaking.

Is there anybody in the audience who has had experience with soaking for a considerable period of time? We would like very much to get somebody outside of our area to give us a little information on that.

ROSS: We are not doing it as practice, but we have tried soaking for as long as 72 hours and I will say it is not as good as 24 hours.

LORD: When you did the 72 hours soaking, was your temperature such that you kept the bacterial action down, or did you use preservatives?

ROSS: We used preservatives and, offhand, just looking at the finished leather, you would say it had an "under-tanned" look. With a 72 hours' soak, you would expect poor flanks, loose and flabby, but this was not so. Our normal soak is 24 hours in the winter and 18 hours in the summer.

LORD: In other words, you have a varying temperature in your soaks?

ROSS: Yes.

LORD: That is quite common in a lot of tanneries. Thank you very much for your comments.

What we ought to discuss, though, is a thing that we are frequently asked—how can you tell if leather is under soaked? What happens if you do over-soak it? Has anybody had experience along those lines? Can we say definitely what we would expect if the leather was definitely undersoaked?

Is it possible that under-soaking causes a definite tendency to get cracky grain? Would that fall in line with the thoughts of others in the audience? I think from over-soaking, you do get depletions, particularly at higher temperatures, but definitely a greater let-out to the skin.

TURLEY: I am not in the tanning business as you know. I just stand on the side line and throw in a few chemicals. However, I would like to ask a simple question concerning soaking: How can you tell when a skin is properly soaked?

LORD: I think that question is well taken. How can you tell when a skin is properly limed? How can you tell when it is properly bated or tanned? The only way I know is to wait until the skin is finished and look at it on the table. Up to this point everything has been a matter of judgment or formula, a means to the end. Now however, you see it finished, you know how it was soaked and all the following processes to which it has been subjected. So, if the leather is good, you would be inclined to say that the soaking as related to the other Beamhouse processes had been proper.

LOTZ: In commenting on soaking on side leather, I would like to throw in a provocative system that has been worked into our production. We had a problem of not having enough pit space for our production and so, in order to obtain liming space, we had to do something else in the way of soaking. We are therefore soaking in drums

Our process is to wash the stock starting at a temperature of about 65 degrees F. and then to slowly increase the temperature to around 80 degrees during a thirty minute washing period. Then, at that time, we run the temperature of the whole stock and wash solution up to 90° by filling the drum up to the gudgeon. We then run for a 30-minute period, let it stand an hour and a half, and then run for 30 minutes more. During this soaking period of about three hours we use approximately 12 per cent of salt in that solution and also a small amount of tetra-sulphide. At the end of the three and one-half hours we drop our temperatures back to 70 by continuing to run colder water into the system, drop the stock out of the drum, leave it on pallets overnight and go into further processing the next day.

We were a little skeptical when we ran our first set of drums on this process that perhaps the stock would be undersoaked, but we found no experience like that at all. At the present time we are running our stock in 41 drums and we handle most of our 30-pack a day production in this manner. The only place where we differentiate is when we get dry hides or dry salts, and we usually leave them in the pits for 24 or 48 hours.

SART: Do you run a sulphide process following the short soak to burn the hair?

LOTZ: No. We have a two-day beamhouse process in which we use sulfide and sulfhydrate.

LORD: That is a very interesting method.

We have also brought out the fact that soaking is definitely part of our beamhouse process, part of the processing of the skin, before we tan. I think, from this brief discussion of soaking, those in the audience can see that soaking does

not just consist of putting a skin in water and letting it stay there. There is something done in that process that helps to make leather.

One thing we have not considered: It is customary in calf skins and some side leathers to mechanically work those skins and mechanically flesh those skins out of soak. Particularly in a calf-skin if you want to produce a quality grain leather it is necessary to flesh quite thoroughly. If this is not done we find that liming proceeds very unevenly on the skin. We would have hard areas and soft areas, and spots where the hair would actually be difficult to remove. So it is very common, in calf-skins at least, to flesh the skins during some part of the soaking operation.

The process that Mr. Lotz discussed concerning the use of salt in the drum, recalls the things we heard about soaking a number of years ago—that the concentration of salt in a soak is necessary to remove some of the coagulable proteins that we want to get rid of.

Did I understand correctly that at the end of your soak you washed, piled the skins down to allow them to drain, so that the salt going into the limes was not excessive?

LOTZ: No. We carry the salt right in the lime process.

LORD: That, again, is a very interesting and controversial point. If you read some of the literature you will find it is very necessary to wash your skins a long time to get rid of all the salt in them, because when salt gets into lime, it makes very poor leather. That apparently has not been the experience of all who make good leathers.

JOHN BURKHARDT: I would like to ask Mr. Lotz—in this process of soaking in drums, he mentioned the fact that he started off with cold water and brought the temperature up to 85 degrees and then dropped it back down to 70 degrees in a space of three hours. Do you find in your finished leather any tendency toward crackiness?

LOTZ: No. That is why I say this process is so provocative, and we were scared of it at first. We consider soaking, when you are using salt, to be almost a continuation of the curing process. We use a high concentration of salt and, of course, when we run 2250 pounds of stock, we bring in 300 pounds of salt along with the stock and then add another 300 pounds on top of that, or 600 pounds of salt for approximately 2250 pounds of stock. That gives you a salt concentration in the drum that is fairly high. I think the solutions actually analyze out about 6 per cent, or something like that. So we actually think we are getting a continuation of the curing process. This has worked out very, very well with under-cured hides.

We in the side leather business, especially when buying country hides, are continuously plagued with buying under-cured stock. We have found this method works well with low-grade hides.

Incidentally, you do not have to add fungicidal material, because you will find that high concentrations of salt are a sufficient inhibitor against bacteria.

BURKHARDT: Do you find the increase in salt retards any swelling in the limes?

LOTZ: So far we have found no decrease in swelling. There is a possibility. We have been running on the process now for five months and we have seen no particular ill effects in the leather. The fact of the matter is that sorting-wise, and in the light of examining and making Army retans and combination tans and straight chromes and mechanical leathers, we feel we have a better piece of leather by that type of process.

LORD: The fact that we have salt in the limes is not new, if we can believe our literature. The German process of beaming calls for the use of salt in the lime. Whether this addition of salt cuts down the swelling, I do not know; possibly it would require a lot of salt in a lime liquor to cut down swelling.

GOETZ: Relative to the soaking process on cured stock it has been our experience that the final removal of salt is important. However, its presence initially aids in the removal of coagulable proteins and when necessary serves the purposes mentioned by Mr. Lotz. We conducted soaking tests on 5/7 calf skins which are the most difficult, particularly grassers, to produce leathers with smooth shoulders and bellies.

We overnight soaked one dozen skins in a ten per cent salt solution and another comparative dozen in their own (two per cent) solution; ratio 1:4. These were then green fleshed, washed and re-soaked three hours as is the usual practice. Each lot was thus handled separately throughout the subsequent operations.

When the leathers were finished and the lots mixed the ten per cent salt-soaked skins could be readily picked out. Several tanners—Messrs. Dr. Merrill, A. Shubert, and W. Morris examined the leathers and they too thought the apparent difference of the lots outstanding. The ten per cent salt soaked stock was much more belly drawn and head wrinkled than the comparative stock. However, the former understandably did have a rounder feel.

At unhairing the stronger salt-soaked stock did not unhair as readily and was not as well laid out.

In heavier weighted stock the greater cohesive forces of the fibers considerably prevent drawness and the effect of salt in this respect is not as pronounced.

LORD: You found out that the amount of salt in the limes on the five to seven pound skins affected the let-out of the skins?

GOETZ: Yes.

LORD: And if I understand, those skins would go into the lime containing a fair amount of salt?

GOETZ: Yes. The salt content of the limes of each lot was measured. I do not recall the figures, but the salt content of the higher salt-soak lime was two

to three times higher than the other. I checked with some of the work of Dr. Merrill. He stated that in their tannery they keep the salt down to a definite minimum. That is one of the reasons, I think, for the resoak after fleshing—to eliminate salt.

LORD: Do you think it would make a difference depending on whether your lime was one in which you destroyed the hair or one in which you saved the hair?

GOETZ: The English did considerable work on that subject and found a small amount of salt gave greater swelling, and larger amounts produced a decrease in swelling.

LORD: Then you would definitely say, as far as the five to seven pound calfskins were concerned, the presence of salt in the limes was detrimental.

GOETZ: I think carrying salt into the limes does no good. The basis of selling leather is grade and area. Whatever additional roundness mentioned was imparted by the salt might be obtained possibly by using more chrome in the tan. I understand tanners who were using 6 to 7 per cent of prepared tan, now use 9 to 10 per cent.

LORD: I think discussions like this are what will do us good from this meeting. These things are not printed in literature or in the Journal. If we can discuss them in meetings like this we will benefit from them.

HILBERT: After many, many years of experience and observation in tanneries, I have reduced the soaking to one simple formula and that is that when hides become soft enough, they are soaked enough. When hides are soft enough, it is just utter foolishness to soak them further. Therefore, the preparation of the stock before the actual soaking is very important.

Now, when a shipment of green salted hides comes in, especially in hot weather, they may be dried considerably on the outside, while the inside is still comparatively moist.

On such hides, it it very good practice to open up the bundles and pile the hides for some time before soaking, thus letting the moisture that is in the interior become more or less evenly distributed. This is one good start.

Another good start is, if the hides, especially country hides, are received in the time of the year when there is a good percentage of what we call "manure" hides, it is also a good plan to set them aside and to run them in an open slat wash wheel to remove as much of that manure as possible. In that way you do not contaminate your first soak.

I have always been in favor of soaking for an initial period and then fleshing, and then putting them back in another soak for the cleansing process. Therefore, soaking involves not only softening, but also cleansing. So we can add to the formula that when hides are soaked long enough to become soft, that is one object accomplished.

The other object is that hides be soaked in such a way that they become clean enough for the limes. Therefore, as far as salt is concerned, the hides as a rule contain enough salt to take care of them in the first soak, and the second soak removes that salt. Therefore, I have never been in favor of bringing salt into the limes, because we want, not only to loosen the hair, but also to swell the hides so that when they are presented to the unhairing machines, a more uniform and level surface can be obtained. That is the result of many years observation, and I hope it will register something.

LORD: Thank you very much, Mr. Hilbert, for your observations.

LAMMERT: There are quite a few tanneries, especially here in the East, where we have a pure paddle soak, we put the hides in the paddle, wash them in there and finally use the soak water as the start of our liming.

It might be a good idea to discuss this method a little bit more in detail because it is used in the East quite a bit.

LORD: As Mr. Lammert points out, sometimes from the labor point of view, it is wise to put your skins in a paddle, and wash them first, then allow them to soak for a period of time; or, soak them first in the paddle and then wash them. Then when the skins are sufficienty soaked, (they do not flesh them), they start the liming or sulfiding process directly in the same vat and in the same liquor.

Would anybody like to discuss this point?

SART: I can say this: We ran side leather for a number of years. As Mr. Lammert pointed out, we soaked over night in a paddle, and on the next day washed for one hour, then sulfided with satisfactory results. At one time we ran into water pricks, but when we soaked and sulfided right on top, in the same paddle, we eliminated the water prick.

LORD: A number of years ago, we were troubled with water pricks in our leather, and found the cause to be just as has been mentioned. We were soaking at that time in vats that were used for nothing but soaks. These vats had become contaminated with bacteria. By soaking in paddles and liming in these same paddles, we were able to completely eliminate all trouble with pricks. The organism causing the pricks in the leather was apparently destroyed in the lime solution.

BERNARD: With washing and liming in the same paddle, did you have trouble with curling along the backbone of the sides?

LORD: That is what Mr. Lammert calls "Holy Rollers." I think everybody has it at some time.

Will Mr. Lammert discuss that?

LAMMERT: There is not much to discuss about these "holy rollers". We all know that when we soak and lime whole hides as such in a paddle, that the hide

will not roll or curl as it swims or tumbles around. However, when we cut the hides in halves and take these halves or sides and put them in a paddle and start to paddle right away, then we are sure that some of these sides will roll.

LORD: How do they roll?

LAMMERT: They roll mostly from the backbone to the belly, with the hair side in. If they have rolled, our experience in the tannery showed that they will unroll after a while in some cases. If we find they do not unroll, there is only one thing to do and that is to take them out right then and pile them down flat. Otherwise we will have partially unhaired skins at the end of the liming, then we are in a fine mess.

There is one way to avoid this rolling. We take the sides, put them in the paddle, and just immerse them in the solution, with the minimum of motion until they have become fairly well plumped. After they are swollen, there is practically no chance of rolling the sides.

LORD: In other words, rolling occurs when the sides are in motion, by paddling while the skin is in the swelling stage, or in the early part of that swelling state. It can occur in the soaks before any chemicals are added, as well as in the sulfiding process.

LAMMERT: I have seen quite a few rollers. I remember one time when they rolled in the wash mill before the sides had been soaked. In this particular mill some of the pins had fallen out, and there is a chance that the mechanical action of this mill—the sliding over of the sides started the rolling, and once it had started it went ahead.

I have found in my experience that the design of a paddle may have a lot to do with the amount of rolling. Some tanneries use the old style pits, and hang a paddle wheel on top of the liquid. It is either not deep enough, or it may be too deep. In case we do get rolling, the first thing to avoid is any unnecessary mechanical motion of the sides until they have obtained quite a degree of swelling.

LORD: The reason Mr. Lammert was asked to discuss rolling was because his expression, "holy rollers", is a very good description of the thing that happens.

At the start of the last war, we were converting part of our production from calf-skins to side leather, and for a time we were troubled with "rollers". I think the explanation is that the flesh starts to expand before the grain and your side curls up in that direction with the hair inside. They are very stiff and very elastic in this condition. You straighten them out and they want to go right back where they were again.

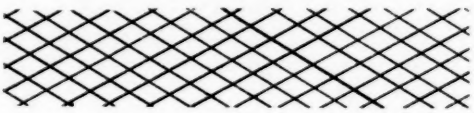
TURLEY: I would like to give a viewpoint more on the scientific angle of soaking.

Soaking is undoubtedly a two-fold phenomenon—chemical and physical. I don't want to touch on the chemical side just now. It is very important, but I

think the physical side is also tremendously important.

If you will accept the idea that leather, being a fibrous product—then, the properties of leather depend on the final disposition of the fibers—and if you keep in mind the histology of a hide, then I think you can follow what I want to draw on the board.

(Dr. Turley sketched on blackboard.)



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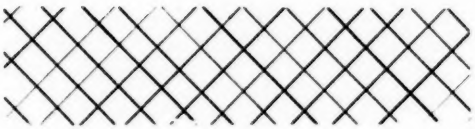

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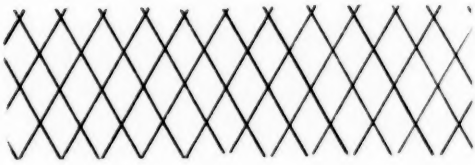

PLUMP

ARRANGEMENT OF FIBERS IN A SKIN

VERTICAL PATTERN

That is a very much over-simplified picture of fibers in a skin. If you take the center diagram, the fibers are all about 45 degrees with each other—that may not be entirely correct, but let us say it represents a skin in its normal state. Now we know there are two plain types of leather, those of a full and solid nature, and those of a stretchy nature. The former would be represented by the diagram on the bottom of the blackboard, and the other by the top diagram.

Now it seems to me in soaking you can start controlling that feature. You might argue that you want to bring back the hide or skin to the first condition —the center diagram. Some of the factors that produce the other conditions will be harmful.

If you are trying to make plump leather it is going to be that much more difficult if you have a flaccid hide or skin after soak and vice versa. Some of the factors which influence that effect are the following (and this is just a list that occurs to me offhand): Long times, high temperatures, presence of salts, degradation products from hides—these give you the "lowest" type of pattern, the flaccid type. There is nothing wrong with this if you want to make that type of leather. Pure solutions, absence of salts—incidentally, hard water as compared with soft water—tend to give you the other pattern.

Now you have your mind on the leather you are trying to make, and you have your eye on the process, and these ideas can be applied to liming, bating, and tanning. So you judge your soaking in the light of the final product.

I just offer as an idea that possibly the center diagram—where the fibers are about as they are in this wicker chair—the fibres are brought back to the original condition, and then are changed later on in the bating and other processes to get the final pattern of fibers in the leather that you are making.

I just wanted to give you a point of view which, at least to me, has been very helpful in looking at the beamhouse problems.

LORD: Thank you, Dr. Turley, for another viewpoint on the soaking problem. One thing we have not mentioned, that may not affect very many here, but when we receive hides or skins from areas where the BAI says there is hoof and mouth disease, we are required by the Bureau of Animal Industry to soak those hides for 24 hours in the presence of a solution of sodium acid fluoride, maintaining over the period of 24 hours, a pH not to exceed 5.5 to 6.0. Has it been the experience of anybody that they are unable to make leather by soaking it for 24 hours under the conditions as prescribed by the Bureau of Animal Industry? I am wondering how those who soak for the shortened period of time get around that factor.

BERNARD: There is an old theory in soaking, especially dry hides, that they should be properly softened and soaked before any mechanical action takes place. Now I know the newer theories seem to be on a faster and quicker system of soaking. But I think any of the fellows who handle limp, dry goat skins, will acknowledge that we have a little different problem than the fellows working green salted calf or side leather.

It has never been proven to me directly that the quicker method, whereby the fibers have been mechanically distended or mechanically moved about has been any better than the method where the skin is allowed to lay at least one or two days in soaking.

I would like to have some expression from some of the goatskin fellows as to whether they have decided that the old method is still the best or the new

method is best. I recognize very strongly John Ivany's theory of the ladder.

IVANY: It is Dr. O'Flaherty's.

BERNARD: In the summertime, when we have pond water, the water varies and the temperature varies. We try to regulate it by heating the water for an average for the year. The water changes so that the pH in the wintertime will be, in this water, which is a moderately soft water up in our county, from 6—and if that water is not treated the pH will get up to as high as 9. That is a factor that does not affect the fellows who soak for three hours, but for the fellows who soak two days or 24 hours, it is a big factor.

We recognize these points and try to treat all of these different conditions we have. We still do not know if we are doing it in the best way. We have to use fungicide in the summertime, and in the wintertime, it is at a minimum. I know that some of the fellows making kid leathers on hard natured types of skins have a very quick process. Some of them have 24-hour soaking. But we have never fully convinced ourselves that this is right.

I would like to hear from some of the newer theory people on that end of it. We will have a three day soak in the wintertime and usually a two day soak in the summertime. And the breaking, as a part of the soaking, I believe, has the effect, actually, of more conditioning of the skin and softening it too much and washing too much out, in a drum, rather than a period of soaking, unless some bacterial action takes place in the soaking. I would like to hear what the new idea is against the old theory.

LAMMERT: I think Mr. Bernard is right. We certainly have to soak kid skins first and bring them into condition so that we can put them in a mill and break them up.

When we talk about kid skins, we really have to talk only kid skins. We certainly cannot, right at this point, from the practical way of making leather—we cannot throw kid skins, calfskins and side leather together. We have to keep the kid skins apart.

So I believe, Mr. Bernard, we first have to soak the skins sufficiently so that we can put them in the mill, then we usually turn on the water and wash for a half-hour; is that correct? After that, we start to dry-mill the skins. In other words, we have softened up the outside at least sufficiently so that we can break it up in a mill and let some of the moisture get inside.

The only time that I have soaked dry kid skins for less than two days was when the contract tannery, which processes all kinds of skins and hides, was in a jam and had to put their kid skins through in an ordinary way, and they had to soak them probably half a day then wash, and then paddle until they were sufficiently soft. But I believe Mr. Bernard is right, that we have to really thoroughly soak a dry kid skin before we can start the real wash and breaking up operation.

BRAUNSCHWEIG: It seems to me that at this point in the discussion it is worth while to stop for a moment and summarize what we have discussed so far.

We understand from the variety of tanners present here that as to soaking there are all kinds of variations in the soaking process, from an extremely short soak to an extreme length of soak. There is a low temperature soak and a high temperature soak. And I do not tell anybody anything new by saying that it seems to me right and proper to discuss the soaking as a variety of procedures, but as far as leather is concerned, it seems to me necessary to consider it an individual process only in connection with all subsequent operations in that particular tannery, because every tanner knows that the moment he changes his soak from a quick soak to a slow soak, at least he has to change his bate. Most probably he has also to change other operations, going as far as to the finishing operations. So the soak, in itself, if somebody comes up with a question of whether a short soak is good or whether a long soak is better, he does not, in my opinion, have a point because the question can be raised only: Do I, with a short soak in my particular operation, accomplish the results which I desire for the final character of my end product?

And this should apply not only to the soak but also to all consequent operations during the tanning and finishing operations.

LORD: I think that point is well taken. As was said in the beginning, you cannot consider soaking as an operation in itself. You have to consider soaking as it is related to your liming, to your bating and to your tanning, and even up to your finishing operations.

LAMMERT: I would like to ask this question. Does this wash right at the start have any influence on the formation of grainy side leather? In other words, when you take a unit of sides of considerable weight and throw them into the wash mill, then wash with a very short flow of water for thirty minutes, we know that the outside of the hide will get more water and more moisture, than the inside in that short time.

I would like to ask, Mr. Chairman, if there is any chance that this washing procedure produces a distortion, loosening or puckering up of the grain. Can we find right here possibly, the cause for some of our rough finished leather?

LORD: Mr. Lammert brings up the fact that in a lot of cases at the very start of the soaking the skins are taken from the hide-house, thrown into a drum with a minimum float and are milled for a considerable period of time in order to equalize the dry edges and the wetter interior. Can it be possible this milling has a bad effect on the character of the grain? What is your idea on that, Dr. Turley?

TURLEY: I still think that fits in with the viewpoint I expressed a while ago. In discussing goat skins you have the structure at the bottom of the diagram with the fibers glued together. Anything you do to open them up is all right.

I do not agree with Mr. Bernard that you have to do a lot of milling, because quite a few years ago, in connection with the enzyme unhairing process, we worked out a mechanical method as applied to dried goat skins. They were soaked in the paddle with the assistance of some alkali and caustic soda. Next day a little more was given and washed out. What I think happened was this: We produced an effect as in my top diagram due to the akali. By the time we were through, we got to the middle diagram as I have it on the blackboard, and we obviated, in many cases, five to nine hours of milling in the drum.

When you come to heavy hides, they are so thick that you can have parts of them that are dried out, I agree, and it is a good idea to give them an initial type of soaking to try and level the moisture and get some water in the dry-spots, and then rely on time to equalize the hydrating back of the fibers in the general soaking of the hides.

As you have heard from this discussion, there are myriad ways of soaking hides and skins.

QUESTION: In recent years there has been quite a discussion on brined hides as compared with green salted hides. What modification do tanners make in soaking brined hides in comparison with the dry salted hides?

BRAUNSCHWEIG: If I understood the question of brined hides from the gentleman, I believe he was talking about hides brined in this country and not imported brined hides.

We have had experience with brined hides, and I believe the brining of the hides in this country has not sufficiently progressed as yet in this respect, that some of the brined hides are insufficiently cured and consequently there is damage and maggot infection even before they reach the tannery. Some of the packers have not been sufficiently careful in handling these hides.

So consequently, if you receive such a type of hide, with a material damage and with maggots, it is obvious the finished piece of leather will not come up to the standard you would use on a perfectly cured hide. And if the hides are well cured a shorter soak, of course, is adequate, because they come already in a much damper stage into the hands of the tanner.

LORD: You brought up one point we have not discussed, that maybe is a good one to discuss. A lot of tanners do not have nice packer or small packer hides. They work country hides, number three, many of which have hair slipping before they ever put them in the works. We have to make leather out of skins like that.

What is the experience of the tanners here in regard to processing skins that are decidedly hair slipped, let us say, or decidedly dirty, or skins that have slipped before going into the soaks? Can someone inform us the best way to handle such skins in the soak?

HILBERT: I think the method I outlined when I spoke before is really the best method that I was able to work out, and I believe it is the best method that

anybody has been able to work out. There is no sense of putting those delicate hair slipped hides into a dirty soak. Or, in other words, to put them in a soak before the damaging material has been washed or beaten off of those.

I heartily believe that the paddle soaking of such hides, or the mill soaking of such hides, merely transfers that dirt into these partially decomposed areas, and it will make those areas worse.

So, therefore, get off all the dirt and all of the manure before they go into the soak. To do that by a short, dry milling will accomplish a great deal. I do not mean to remove the manure by drumming them in a slap wheel, that a great amount of water shall be used, but simply that the friction of those hides going over each other will take that manure off and loosen it. And before the hide comes out of the drying mill, just pour in a liberal stream of water to carry the loosened manure away. Have that milling last no longer than 12 minutes. I have found that that is a better way to take care of hair slips.

Of course, when we receive a carload of hides, we always look for those imperfections because it pays to do so, because of your allowances. Therefore, if a carload of hides shows up with hair slips in it, it would be utter foolishness to handle those hides in the same way as you would handle a perfect carload of hides. Therefore, the one mistake that tanners—I won't say invariably, but that they often—make, is having too small a hide house to enable them to properly sort the hides before they go to the soak, because a few of these bad hides will be enough to contaminate the pack if they go through. And there you have the source of the water pricks that you brought up.

LORD: Now, on the other side of the picture—I know from the past discussions we have had that there is another side to look at—and I wonder if Mr. Sart will present that other side of the picture?

SART: I was just going to ask this gentleman a question: After he has cleansed the hair-slipped skins or hides, would he cut down on the period of soaking of the damaged hides, or soak them the normal length of time?

HILBERT: No. As I said before, when hides are soft enough, they are soaked enough. And the chances are that these hair slipped hides will soak up and become softer much quicker than a normally good hide. Therefore, cut down the time of soaking.

SART: Some people believe that the good part of the hair slipped hide is just as good as the packer. So why should you cut the soak on that part of it, or make inferior leather from it, just to try and save the part that is already damaged?

HILBERT: Well, you have a danger, when hides start to slip—it is a bacterial action, and if you are not careful, you will spread that decomposition, or bacteria which cause it, into the good parts of the hides, and your hair slips cover a bigger area and you also contaminate the rest of the hide to a certain extent —not entirely.

SART: Then you would recommend using judgment and not going the whole way, one way or the other?

HILBERT: Absolutely. As someone brought out the question of the ladder —Dr. O'Flaherty called it first the flight of stairs. In other words, we like to prepare the hide in soaking for the liming, and when they are soaked properly, they are all right for the lime.

But there is another point, that the hides, before they go into the soaks, must be properly prepared. That is starting from the floor.

LORD: When we said at the beginning of the talk that the meeting would proceed as far as possible, I think we really thought that it would proceed a little further than soaking.

The next thing we are going to take up is beaming. We will consider beaming from two angles only. Let us consider first the sulfiding process—by which I mean one where the hair is actually destroyed or pulped. There is no question that good leathers are made by pulping the hair and good leathers are made by saving the hair. In many cases it is purely a matter of economics, how big your tannery is and how many skins you must unhair in so many square feet of floor space or so many vats. It is sometimes a question of how many skins can be processed in a given area.

In the New England area, most skins are sulfided. Mr. Baker, would you, at this time, explain briefly what we mean by sulfiding leather?

BAKER: To give you our own experience, we use a combination of sulfide and sulfhydrate with a small amount of lime. We add our lime ahead of the sulfide and sulfhydrate, which I understand is wrong, but it works. As I said before in discussing soaking, we use a twenty-four hour process. We do not do any beaming at all or any unhairing on the machine. We just send them right on to the fleshing machine.

LORD: You say 24 hours in that solution?

BAKER: Yes.

LORD: After it has been in there for 24 hours, have you run those skins in the paddle for some time?

BAKER: They have actually been run three hours. We run 30 minutes on three feeds. We wash them two hours straight.

LORD: That would be after your 24-hour period?

BAKER: Yes.

LORD: Then they are taken out of that solution and go to the fleshing machine?

BAKER: Yes.

LORD: And your skins are cut into sides at this point?

BAKER: Yes.

LORD: I say there is no theory that is wrong if you make good leather by using that theory, apropos of what you have said.

BAKER: It is always a question of who is making good leather.

LORD: One other thing Mr. Baker brought up, and it is an interesting thing that is not done in every case—he added his sulfide and sulfhydrate gradually and not in one feed. There is a distinct difference in a sulfiding process as to whether you add your sulfide or sulfhydrate gradually or all at once. In one case, you have a large alkalinity present for a short period of time; the other way, you keep your alkalinity down and your curve a little smoother as far as the pH and alkalinity is concerned.

There is one thing that Mr. Baker does and some people do not do. He says that they wash for two hours and then send the skins to the fleshing machine. Is there any experience on the question of whether you wash or do not wash at that time?

I am sorry that one of our New England tanners is not able to be with us this morning, because he has some definite ideas on this subject. He says, "What do you want to wash for if you do not have to wash? I make good leather without washing."

I say, "Can you handle them on your fleshing machine without slipping?" And he said his men seem to be able to.

I said, "You must wash them some place. Maybe you leave them in the water overnight with a small amount of lime before you bate them." Maybe you have to do that if you split in the lime. Whether he does or not would be up to him to say. I would imagine that at some point in the process, if you did not wash them, you would want to get ride of the sulfide that is in that skin. When you destroy the hair, the sulfide content of the skin is pretty high, and without a wash of some kind, one would expect the sulfide to be still high out of bate.

Would anybody care to discuss that point?

LAMMERT: I am really amazed that nobody takes the floor on this subject. It shows that they are all young gentlemen. I know from my training, and especially from my work in New England, that just about 15 years ago there was no other way of making leather but washing the leather for five hours. The wash started at two o'clock in the morning and continued until seven. Of course we have to consider that they had probably a two-inch water line going into this department with about five paddles going all over. That means that really the washing was not too thorough, but for five hours these skins were slung around in the paddles in some kind of heavy mixture of lime, sulfide, water and dirt.

At that time I came in as a young man, and I thought what would happen if we didn't wash? So, without saying anything, I took one paddle and I did not wash this paddle. I watched that pack going through every day and didn't say a word. When this pack came to the shipping room the sorter could find no difference between the pack that was washed and the pack that was not washed.

If anybody has had a similar experience, I would like to hear something about it.

LORD: One thing Mr. Lammert said might make the difference: he sulfided the skins and relimed them before washing. When you relime, is it not possible that the skins are leached at a high pH, and the sulfide partially removed in beneficial manner? I am bringing out this point in an attempt to initiate discussion on the question.

BRAUNSCHWEIG: It seems to me, as far as washing in the lime is concerned, we have to take into consideration the character of the water with which we wash. In soft water, washing can be extended for considerable time to remove lime and sulfides without ill effects to the grain. A hard water, under similar circumstances will cause lime blast by precipitation of calcium carbonate in the grain. It is also important to consider the following operations. If fleshing is followed by graining, the stock must be conditioned for the removal of the hair roots by reduction of the swelling. On the other hand, if stock is washed with water containing calcium bicarbonates, the resulting rough grain will make the graining operation more difficult.

Therefore, in my opinion, the important point to consider in a tannery is the type of water for the washing, in connection with the following operations.

While I am here, I would like to ask a question which is in connection with the soak as well as with liming. In the past two or three years, in our tannery, we have had experience of a continuous increase in veininess of our hides, and we are not clear as yet as to the source of this veininess which on certain hides is very bad. It does not matter whether the hide comes from packers—we have noted it on big packers and small packers. We do not know whether the cause of this veininess in the hide is in the soak or in the lime.

I would like to ask other gentlemen whether they have had a similar experience.

SART: In answer to Dr. Braunschweig's question, in my observation of veins, veins come where perhaps the leather is a little too solid and not cushioned enough, so I do not think it necessarily would be the soak. It may be undersoaked. It could be the liming. It surely could be the tanning. I would like to hear from some other folks who might agree with me on that.

The main thing I feel I want to add is that the leather is not round enough or cushioned enough. It is too flat or solid. And the veins invariably come to the surface and seem to pound through then.

MERRILL: We have made some salting and liming tests with respect to veininess. We have had trouble with veins, too. I should say first that we normally get a 24-hour soak in water at about 66 degrees Fahrenheit. It warms up a little in the summertime. We do not give any previous milling, but we do paddle a little in the soak and then give a four-day lime without a great amount of sulfide. We tried soaking for 12 hours, 24 hours, 48 hours, 72 hours on comparative lots—small lots of only about 300 pounds, which would mean they are medium calf skins, and some with around 40 or 50 skins.

Then we carried them through to the sorting room and we had one of our best sorters appraise those skins individually for nothing else but veininess. He called them badly veined, medium veined and few or no veins. The vein count went down definitely with the increased time of soaking.

Incidentally, in other properties we could see little difference between the 24 and 72 hour soak. The 12 hour soak was definitely under-soaked. It is not practical for us to soak for 72 hours unless we want to cut our production, so we have tried accelerating the soak to the 24-hour soak by using sodium tetrasulfifide, and it has apparently helped to some extent.

As far as the liming is concerned, we have made some tests with the painting process applying sulfide—lime paint to the flesh side as compared to the regular process in which we save the hair. And apparently there is an appreciable diminution of veininess in this painted stock as compared with the other stock.

Incidentally, that stock is plumper and rounder, but we do not think it has as good a grain. So it seems to us that veins can be minimized by a very thorough soak and by a drastic liming—a plumping liming. We have not gone to the painting process because there are a lot of other considerations, notably the saving of the hair and amount of work involved, and things of that sort.

LORD: Thank you, Dr. Merrill. That is a very interesting point you brought up.

QUESTION: What percentage of sulfide did he use in the soak?

MERRILL: The tetra-sulfide in it was the amount recommended by the Cincinnati Laboratory, and it seems to me it was six-tenths of a per cent on the weight of the stock which, as we use a one to four stock would be about 15-hundredths of a percent in the soak liquor.

Is anybody from Cincinnati here?

I am certain it is that, although we made tests in which we use larger amounts. It did not seem to have any deleterious effect, not any improvement, either.

RODDY: Dr. Merrill was quoting the figures correctly on what is recommended by Cincinnati.

LORD: I think Dr. Merrill's point there really corroborates the previous speaker. I think what Mr. Sart said was that he found that the veins were better when he gave those skins more working, when he made the skins fluffier.

Maybe he meant when they become plumper, when you soaked them more, limed them more and tried to get more thickness into the substance of the skin.

MERRILL: I might make one other comment. We went into the bating question. We varied the time of bating and varied the amount of the bate that we used from none at all to three times as much as we normally used and we could find no effect whatever on the veins, which surprised us very much. Maybe it was just an accident, but we did it more than once—over-bating and under-bating seemed to have no effect at all on the veins.

LAMMERT: I would like to ask Dr. Merrill: What do you call a normal time? Is it a very short time—an hour or two hours? If I bate only, let us say, three-quarters of an hour, and extend that 100 per cent, then I have one and a half hours; but if I already bate two and a half hours and extend it to five hours, we would probably have different results.

MERRILL: Did I say we changed the time of bating? We did not change the time of bating. Our system is to bate stock until it is completely delimed, which means from an hour and a half for the lighter skins up to four and one-half hours for the heavy kip. If I said we changed the bating time, I misspoke myself. We did change the enzymes, and to some extent, the delimer.

LAMMERT: You have answered my question. Thank you.

QUESTION: Were you concerned about the degree of hardness in the water?

MERRILL: We did not make experiments along that line. Our soaking is done in well water, which is pretty hard water, and it is uniform in temperature, summer and winter, which is a great advantage. Our bating is done in Lake Michigan water which is, I believe, a hard water by New England standards, but much softer than our well water, and the skins previous to bating are given a surface deliming with dilute acid.

LORD: I wonder if Mr. Goetz will comment on the point that was brought up a few minutes ago—that is, the advisability of adding lime before sulfide or sulfide before lime? It is a moot question and we would like to have discussion on that.

GOETZ: That is a very nice question. In my position when you teach students they want facts. There are not too many facts in the leather business, but occasionally there are some we can come out with.

Relative to liming in general, I asked Dr. Turley if he didn't think that the first few hours of liming were the most important, and he said, "No, the first thirty minutes." I think that is very important.

To get back to the question: If you take a skin and want the greatest swelling, put it in caustic. Then on a decreasing basis use sodium sulfide, then sodium sulfide and lime, then lime alone, then lime and sulfhydrate, then lime and

arsenic. If you add sulfide before the lime you get more swelling than if you add the lime first. We have found as in making patent leather (hair destruction) that you get a smoother grain if you run stock in the lime first and then add the sulfide. However, the running of 30 minutes in lime before the addition of the sulfide, say 3 per cent, will produce a smoother leather but not as tight, which corroborates our first statement that the first 30 minutes is very important.

LORD: At this time, I will turn the meeting over to Charles Cares, the Vice-President of the New England Tanner's Club, to bring out a few points on the degreasing of sheepskins.

CARES: Generally today, most of the degreasing of sheepskins is done with solvents and the old pressing operation is going out of the picture.

But there are advantages to pressing—reclaiming of grease and better condition of the solvent reclaimed grease is an important item.

SHEPARD: Right now we are having a little trouble with our degreasing. We find that we are not getting a good distribution of our grease and it is affecting our coloring and our tanning which, in turn, affects our coloring in the end. I am thinking of suede leather. On the grain leather, we are not much concerned about it.

Our old process, the process we are using now—and we are experimenting with different detergents—the old process is breaking out the skins with a solvent in a drum, and then taking those skins and fleshing them. After the fleshing operation they are put back in the drum, and run with solvent and emulsifiers. They are run possibly 30 minutes at no higher than a hundred degrees. We like to keep them around 90, but we sneak up to 100 toward the end. At the end of that time, we give them a salt brine wash. It is approximately 150 gallons of salt brine over a half hour period, as this salt brine is washed continually through the drum, through the gudgeon and out through the head. At that time the skins are dumped and horsed and ready for tanning.

I might add we reclaim all of our sheep grease and salt brine. It has a pH of about 2, and it is quite acid. Our skins are strongly acid, having a pH of a 3 or lower. If we washed with a fresh salt brine, we would still have a pH of about 2, but it would not be so concentrated. We are not sure whether we are doing the right thing on reclaiming our salt brine. It carries a lot of proteins and acid in it.

If you have any comments I will appreciate it.

CARES: Would any of the sheepskin people like to comment? We reclaim the grease and let the salt brine go down the sewer.

COX: We do not reclaim our salt brine because we are afraid of that condition.

SHEPARD: I was wondering also whether, if we carry over any of our solvent into any tanning, whether it would affect the tanning. We are running experiments on that.

KOPPENHOEFER: I would say that the purpose of the salt, of course, is to counteract the acid, and if you are continuing to use your brine and build up your acid, and do not compensate by adding more salt, you are not going to accomplish your degreasing. That is probably where you get into trouble.

SHEPARD: Our salt brine is automatically controlled by air pressure gauges that regulate our Baumè and what salt is brought back is replenished by concentrated salt brine and water. So that actually the build-up comes to a definite point and I think will reach an equilibrium where you do not build up more acid over a certain period.

COMMENT: I would like to bring out the point that in determining salt concentration in these brine waters, if you are using fresh brine every time and the Baumè method, you are not accounting for other unknowns which may be creeping into this fortified liquor. That is purely a suggestion. I wonder if there is some other technique of determining the sodium chloride content in that liquor you use, other than just pure Baumè, because in Baumè you are picking up other salts.

SHEPARD: I think that is right. We are taking in other things that would raise our Baumè and give us a false salt content.

LAMMERT: There is one point I have been asked, and the question is: Why can we degrease in wintertime at 90 degrees and have a fairly good job, whereas in summertime with 90 degrees, we are in danger of having a ruined enamel, or a ruined skin?

QUESTION: Is that the starting temperature or finishing temperature?

LAMBERT: Starting at 88 and running up to 92 at the finish, so I consider it an average temperature of 90.

CARES: We could not degrease on suedes at 90 any time of the year and do a sufficient job. A temperature of 90 is too low for a good degreasing job.

LAMBERT: Would it not depend on the mill—how much temperature was building up at that mill?

CARES: Your temperature is fairly well controlled.

LAMMERT: In other words, when we have trouble like that, we should really look into the damage that has been done before.

CARES: Unfortunately, that is where most of the damage seems to come, on enamel.

SHEPARD: We have never noticed any trouble with our enamel from degreasing. I do not think degreasing will affect your enamel at all. It might to some extent in the breaking out of your skins. You may have real dry skins and the amount of solvent you put in may not be enough. You may rub some of that enamel off, then.

LORD: We have now come to the end of our allotted time and your chairman wishes to thank all for being so co-operative. I will now turn the meeting back to President Turley.

TURLEY: I think it is quite obvious that the new ideas we had in devoting a session to the local Tanners' Club has been very successful. The only thing is that we should have started last Monday morning. I do not think, however, we would be finished by next Monday morning.

The discussion was spontaneous, from the heart, and very interesting. I could not help being interested in the language of the leather industry. There was talk about old soaks and Holy Rollers, and I thought if we sat here long enough we might get to talking about Quakers and hardening of the arteries, as well as discussion of the veins.

We have had a very nice meeting here. We thank the New England Tanners' Club and Mr. Lord for taking charge of this part of the session.